CLAIMS

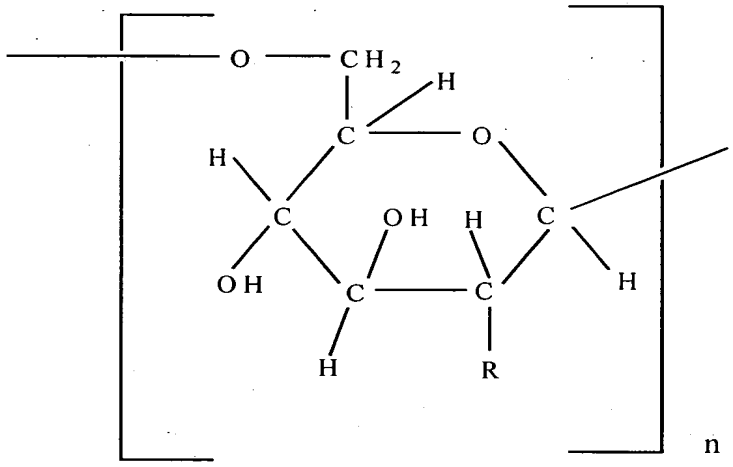
1. A composition comprising

an isolated polysaccharide comprising a β-1,6-glucosamine polymer, having a length of at least four monomeric units, wherein less than 50% of glucosamine amino groups are substituted with acetate, and wherein the composition is sterile.

2. A composition comprising

an isolated polysaccharide comprising a β-1,6-glucosamine polymer, having a length of at least two monomeric units, and conjugated to a carrier compound, wherein less than 50% of glucosamine amino groups of the polysaccharide are substituted with acetate.

3. The composition of claim 1 or 2, wherein the isolated polysaccharide has a structure of



wherein n is an integer that is at least four, wherein R is selected from the group consisting of -NH-CO-CH_3 and -NH_2, provided that less than 50% of the R groups are -NH-CO-CH_3, and having a molecular weight of at least 800 Daltons.

4. The composition of claim 3, wherein less than 45%, less than 40%, less than 35%, less than 30%, less than 25%, less than 20%, less than 15%, less than 10%, or less than 5% of R groups are –NH-CO-CH_3.

5. The composition of claim 3, wherein none of the R groups is –NH-CO-CH_3.

6. The composition of claim 3, wherein n is an integer selected from the group consisting of at least 6, at least 10, at least 20, at least 50, at least 100, at least 200, at least 300, at least 400 and at least 500.

7. The composition of claim 1 or 2, wherein the isolated polysaccharide is a hetero-substituted polymer.

8. The composition of claim 1 or 2, wherein the isolated polysaccharide has a molecular weight of at least 800 Daltons.

9. The composition of claim 1 or 2, wherein the isolated polysaccharide has a molecular weight selected from the group consisting of at least 1000 Daltons, at least 1200 Daltons, at least 1500 Daltons, at least 2000 Daltons, at least 2500 Daltons, at least 5000 Daltons, at least 7500 Daltons, at least 10,000 Daltons, at least 25,000 Daltons, at least 50,000 Daltons, at least 75,000 Daltons, and at least 100,000 Daltons.

10. The composition of claim 1 or 2, wherein the isolated polysaccharide has a molecular weight selected from the group consisting of at least 125,000 Daltons, at least 150,000 Daltons, at least 200,000 Daltons, at least 250,000 Daltons, at least 300,000 Daltons, at least 350,000 Daltons, at least 400,000 Daltons, at least 450,000 Daltons, and at least 500,000 Daltons.

11. The composition of claim 1 or 2, wherein the length of the β-1,6-glucosamine polymer is selected from the group consisting of at least 6, at least 10, at least 20, at least 50, at least 100, at least 200, at least 300, at least 400 at least 500 monomer units.

12. The composition of claim 1 or 2, wherein less than 40%, less than 35%, less than 30%, less than 25%, less than 20%, less than 15%, less than 10% or less than 5% of glucosamine amino groups are substituted with acetate.

13. The composition of claim 1 or 2, wherein none of the glucosamine amino groups is substituted with acetate.

14. The composition of claim 1 or 2, wherein the composition has a purity selected from the group consisting of at least 90% pure, at least 95% pure, at least 97% pure, and at least 99% pure.

15. The composition of claim 1, wherein the isolated polysaccharide is conjugated to a carrier.

16. The composition of claim 1 or 15, wherein the isolated polysaccharide is conjugated to the carrier compound through a linker.

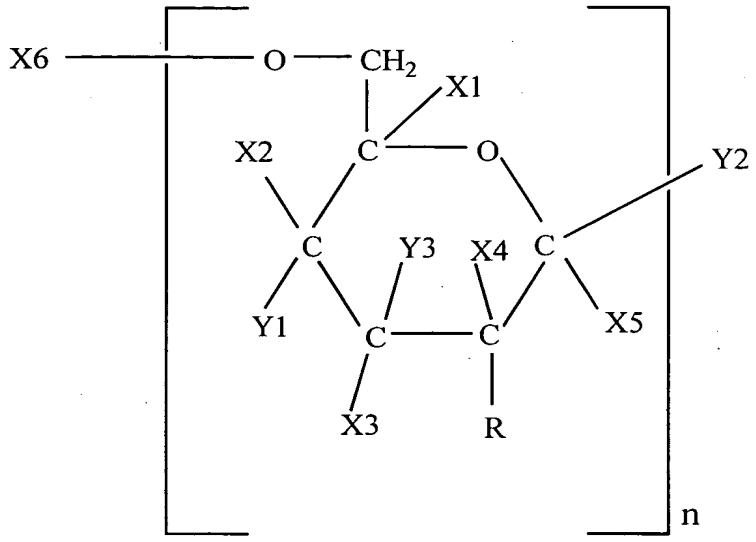
17. The composition of claim 1 or 15, wherein the carrier compound is a peptide carrier.

18. The composition of claim 1 or 2, further comprising a pharmaceutically acceptable carrier.

19. The composition of claim 2, wherein the composition is sterile.

20. The composition of claim 1 or 2, wherein the isolated polysaccharide is formulated as a vaccine.

21. The composition of claim 1 or 2, wherein the isolated polysaccharide consists of the following structure:



wherein each of X1, X2, X3, X4, X5 and X6 is either H, a carrier compound, or a linker joined to a carrier compound; and each of Y1, Y2 and Y3 is either OH, a carrier compound or a linker joined to a carrier compound.

22. The composition of claim 21, wherein only one carrier compound or linker joined to a carrier compound is conjugated to the structure.

23. The composition of claim 22, wherein only one of X1, X2, X3, X4, X5 or X6 is conjugated to a carrier compound or linker joined to a carrier compound.

24. The composition of claim 21, wherein only one of Y1, Y2 or Y3 is conjugated to a carrier compound linker conjugate to a carrier compound.

25. The composition of claim 22, wherein the carrier compound is a polysaccharide that is not an N-acetyl β 1-6 glucosamine.

26. A method of making the isolated bacterial polysaccharide of claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 or 13 comprising

ethanol precipitating a crude polysaccharide preparation from a concentrated bacterial cell body preparation;

concurrently digesting the crude polysaccharide with lysozyme and lysostaphin followed by sequential digestion with a nuclease and proteinase K to form a digested polysaccharide preparation;

size fractionating the digested polysaccharide preparation;

isolating an acetylated polysaccharide fraction; and

de-acetylating the acetylated polysaccharide fraction to produce a polysaccharide having less than 50% acetate substitutions.

27. A method of making the isolated bacterial polysaccharide of claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 or 13 comprising

preparing an impure polysaccharide from a bacterial culture;

incubating the impure polysaccharide with an acid or a base to produce a semi-pure polysaccharide preparation;

neutralizing the preparation;

incubating the neutralized preparation in hydrofluoric acid;

isolating an acetylated polysaccharide from the preparation; and

de-acetylating the acetylated polysaccharide to produce a polysaccharide having less than 50% acetate substitutions.

28. A method of making the isolated bacterial polysaccharide of claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 or 13 comprising

preparing an impure polysaccharide from a bacterial culture;

incubating the impure polysaccharide with an acid or a base to produce a semi-pure polysaccharide preparation;

neutralizing the preparation;

incubating the neutralized preparation in hydrofluoric acid; and

isolating from the preparation a polysaccharide having less than 50% acetate substitutions.

29. The method of claim 26, 27 or 28, wherein the bacterial culture is a coagulase-negative *Staphylococcus* culture.

30. The method of claim 26, 27 or 28, wherein the bacterial culture is a *Staphylococcus aureus* culture or a *Staphylococcus epidermidis* culture.

31. The method of claim 26, 27 or 28, wherein the isolated polysaccharide has a molecular weight selected from the group consisting of at least 1000 Daltons, at least 1200 Daltons, at least 1500 Daltons, at least 2000 Daltons, at least 2500 Daltons, at least 5000 Daltons, at least 7500 Daltons, at least 10,000 Daltons, at least 25,000 Daltons, at least 50,000 Daltons, at least 75,000 Daltons, and at least 100,000 Daltons.

32. The method of claim 26, 27 or 28, wherein the isolated polysaccharide has a molecular weight selected from the group consisting of at least 125,000 Daltons, at least 150,000 Daltons, at least 200,000 Daltons, at least 250,000 Daltons, at least 300,000 Daltons, at least 350,000 Daltons, at least 400,000 Daltons, at least 450,000 Daltons, and at least 500,000 Daltons.

33. The method of claim 26, 27 or 28, wherein the isolated polysaccharide has a purity selected from the group consisting of at least 90% pure, at least 95% pure, at least 97% pure, and at least 99% pure.

34. The method of claim 26, 27 or 28, further comprising conjugating at least one carrier compound to the isolated polysaccharide.

35. The method of claim 34, wherein the carrier compound is conjugated to the isolated polysaccharide through a linker.

36. The method of claim 34, wherein the carrier compound is a peptide carrier.

37. The method of claim 26 or 27, wherein the acetylated polysaccharide is chemically de-acetylated.

38. The method of claim 37, wherein the acetylated polysaccharide is de-acetylated by incubation with a basic solution.

39. The method of claim 26 or 27, wherein the acetylated polysaccharide is enzymatically de-acetylated.

40. The method of claim 26, wherein the polysaccharide preparation is size fractionated using a column.

41. The method of claim 26, 27 or 28, further comprising formulating the isolated polysaccharide as a vaccine.

42. A pharmaceutical composition comprising

the isolated polysaccharide of claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 21, 22, 23, 24 or 25, in an effective amount to stimulate an immune response, in a pharmaceutically acceptable carrier.

43. The pharmaceutical composition of claim 42, further comprising an adjuvant.

44. The pharmaceutical composition of claim 42, wherein the immune response is an antigen-specific immune response.

45. A method for treating or preventing a *Staphylococcus* infection in a non-rodent subject comprising

administering to a non-rodent subject having or at risk of developing a *Staphylococcus* infection an effective amount for inducing an immune response against *Staphylococcus* of an isolated polysaccharide of any one of claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 21, 22, 23, 24 or 25.

46. The method of claim 45, wherein the *Staphylococcus* is *Staphylococcus aureus*.

47. The method of claim 45, wherein the *Staphylococcus* is *Staphylococcus epidermidis*.

48. The method of claim 45, wherein the non-rodent subject is a human subject.

49. The method of claim 45, wherein the non-rodent subject is selected from the group consisting of primates, horses, cows, swine, goats, sheep, dogs, and cats.

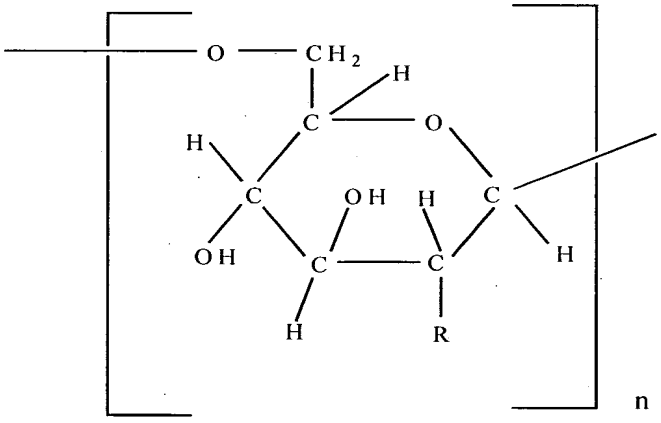
50. The method of claim 45, wherein the non-rodent subject is at risk of exposure to *Staphylococcus*.

51. The method of claim 45, wherein the non-rodent subject has been exposed to *Staphylococcus*.

52. The method of claim 45, wherein the isolated polysaccharide is administered in conjunction with an adjuvant.

53. The method of claim 45, wherein the isolated polysaccharide is formulated as a vaccine.

54. The method of claim 45, wherein the isolated polysaccharide has the structure:



wherein n is at least 4, R is selected from the group consisting of -NH-CO-CH_3 and -NH_2, provided that less than 50% of the R groups are -NH-CO-CH_3.

55. The method of claim 54, wherein the subject has not received a medical device implant.

56. The method of claim 45, wherein the isolated polysaccharide is administered systemically.

57. The method of claim 45, wherein the isolated polysaccharide is administered with an adjuvant.

58. The method of claim 45, wherein the isolated polysaccharide is conjugated to a carrier compound.

59. The method of claim 58, wherein the carrier compound is a peptide carrier.

60. A method for generating antibodies comprising:

administering to a subject an effective amount for producing antibodies specific for *Staphylococcus* of an isolated polysaccharide of claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 21, 22, 23, 24 or 25, and an adjuvant, and

isolating antibodies from the subject.

61. A method for generating monoclonal antibodies comprising:

administering to a subject an effective amount for producing antibodies specific for *Staphylococcus* of an isolated polysaccharide of claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 21, 22, 23, 24 or 25, and an adjuvant,

harvesting spleen cells from the subject,

fusing spleen cells from the subject to myeloma cells, and

harvesting antibody produced from a fusion subclone.

62. A method of producing a polyclonal antibody to a bacterial polysaccharide comprising

stimulating an immune response to the bacterial polysaccharide by administering an isolated polysaccharide of claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 21, 22, 23, 24 or 25 to a subject and an adjuvant, and

harvesting antibody from the subject.

63. The method of claim 62, further comprising isolating the antibody.

64. The method of claim 62, wherein the subject is a rabbit.

65. The method of claim 62, wherein the subject is human.

66. A method of identifying a monoclonal antibody specific for a polysaccharide in a non-human subject, comprising:

inducing an immune response to the polysaccharide,

isolating antibody producing cells from the subject,

producing immortalized cells from the antibody producing cells, and

testing the ability of the immortalized cells to produce the monoclonal antibody using an isolated polysaccharide of claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 21, 22, 23, 24 or 25.

67. The method of claim 66, further comprising isolating a monoclonal antibody from the supernatant of the immortalized cells.

68. A composition comprising

an isolated binding agent that binds to the isolated polysaccharide of claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 21, 22, 23, 24 or 25.

69. The composition of claim 68, wherein the isolated binding agent is a peptide.

70. The composition of claim 69, wherein the peptide is an antibody, or a fragment thereof.

71. The composition of claim 70, wherein the antibody is a polyclonal antibody.

72. The composition of claim 71, wherein the antibody is a humanized antibody or a chimeric antibody.

73. The composition of claim 71, wherein the antibody is a human antibody.

74. The composition of claim 68, wherein the isolated binding agent is conjugated to a detectable label.

75. The composition of claim 74, wherein the detectable label is selected from the group consisting of a radioactive label, an enzyme, a biotin molecule, an avidin molecule and a fluorochrome.

76. The composition of claim 68, wherein the isolated binding agent is conjugated to a bactericide.

77. The composition of claim 76, wherein the bactericide is an antibiotic.

78. A method of identifying the presence in a sample of a bacterial polysaccharide having less than 50% acetate substituents comprising

contacting the sample with the isolated binding agent of claim 68, and

detecting binding of the isolated binding agent to the sample,

wherein binding of the isolated binding agent indicates the bacterial polysaccharide is present in the sample.

79. The method of claim 78, wherein the sample is a biological sample from a subject.

80. The method of claim 78, wherein the biological sample is selected from the group consisting of urine, blood, pus, skin, sputum, joint fluid, lymph and milk.

81. The method of claim 78, wherein the isolated binding agent is conjugated to a detectable label.

82. A method for treating a subject having or at risk of developing a *Staphylococcus* infection comprising

administering the isolated binding agent of claim 68 to a subject in need thereof in an amount effective to inhibit the *Staphylococcus* infection.

83. The method of claim 82, wherein the *Staphylococcus* infection is selected from the group consisting of *Staphylococcus epidermidis* infection and *Staphylococcus aureus* infection.

84. The method of claim 82, wherein the isolated binding agent is conjugated to a bactericide.

85. The method of claim 82, wherein the bactericide is an antibiotic.